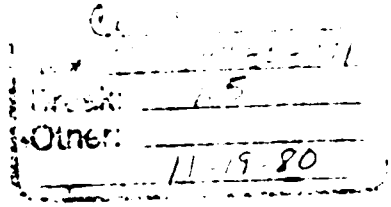
FIELD INVESTIGATIONS OF UNCONTROLLED HAZARDOUS WASTE SITES

FIT PROJECT



TASK REPORT TO THE ENVIRONMENTAL PROTECTION AGENCY CONTRACT NO. 68-01-6056

S00167796
SUPERFUND RECORDS

PRELIMINARY ASSESSMENT AND SITE INSPECTION OF

COLLIS CORPORATION

TDD F-7-8010-4

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Introduction

During the week of September 29, 1980, Region VII EPA received a report of possible cyanide gas poisoning of workers at the Collis manufacturing plant in Clinton, Iowa. Workmen involved in the dredging of the sludge disposal pits at Collis noticed a strong ammonia smell in one of the pits and within two hours developed headaches and nausea. One of the workmen reported the incident to the Iowa Department of Environmental Quality (IDEQ) who, in turn, forwarded the complaint to EPA and the Iowa Department of Labor. FIT personnel were requested (TDD F-7-8010-4) to perform a preliminary assessment and site inspection of Collis Corporation to determine if the facility's waste management practices were adequate for the protection of the environment and public health. Therefore, on November 13, 1980, the Region VII Ecology and Environment FIT team conducted an inspection of Collis Corporation. Mr. Virgil Showerman, plant manager, and Mr. Nello Arterburn, plating supervisor, were interviewed during this inspection; after which, several samples were collected from Collis's waste treatment system. The results of this inspection are summarized in the following report.

Background

Collis Corporation, a subsidiary of Chamberlain Manufacturing Corporation, manufactures chrome-plated wire products, such as refrigerator trays. The facility operates in two eight-hour shifts and employs approximately 275 people. The raw materials used in this operation include sodium cyanide (60,000 lbs/yr), chromate (100,000 lbs/yr), hydrochloric acid (560,000 lbs/yr), sodium hydroxide (150,000) lbs/yr), zinc (168,000 lbs/yr) and nitric acid (1300 gal/yr). Process water for the manufacturing operation is provided by an 1800 foot well on the facility property. This well reportedly provides 250,000 to 300,000 gallons of water per day. Potable water from the employees is provided by the Clinton city water supply system. A sketch of the facility is provided in Figure I.

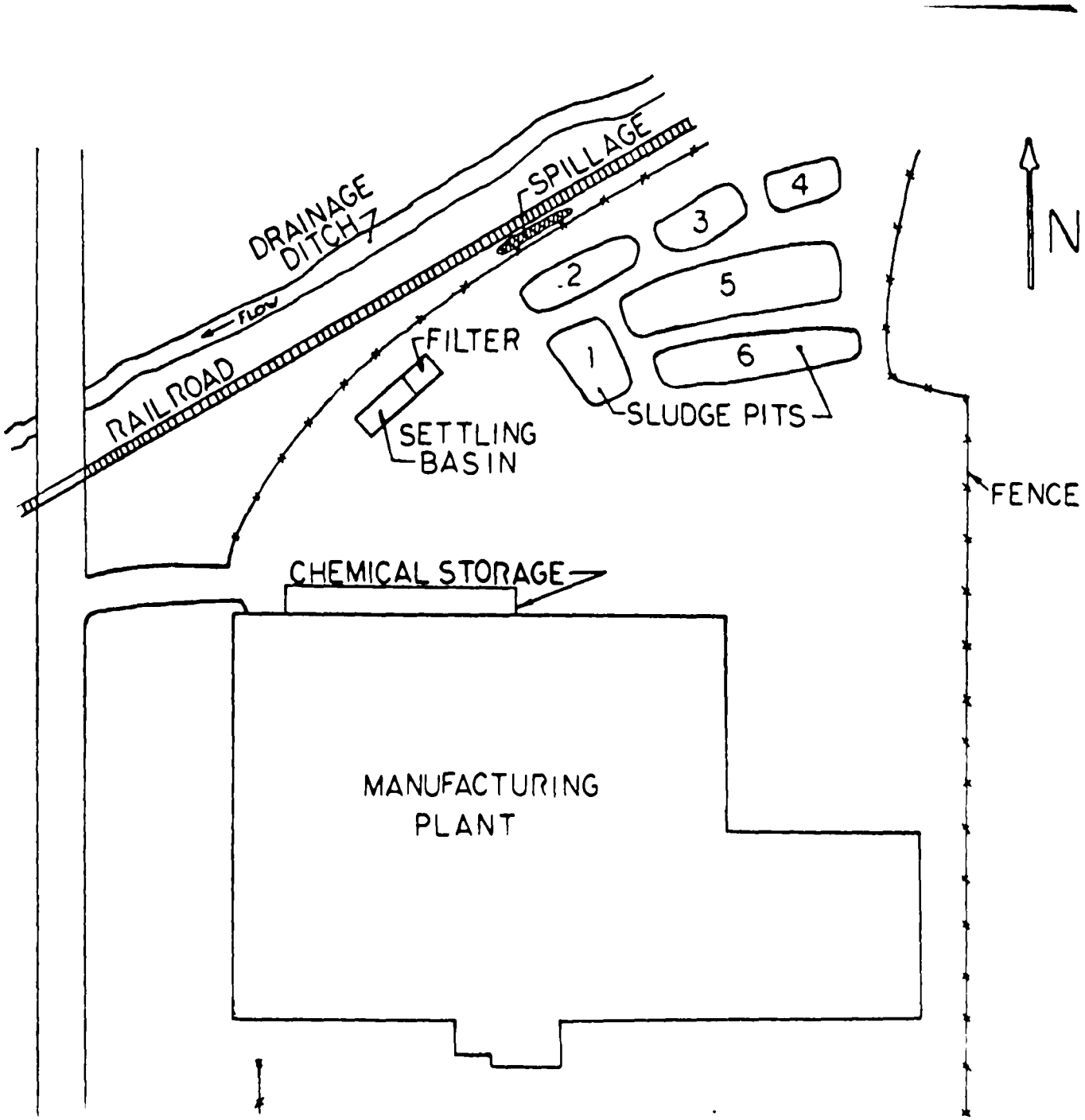

Figure 1. Sketch of Collis Manufacturing Corporation, Clinton, Iowa

Waste Treatment Practices

The three major contaminants of the plant wastewater stream are chrome, cyanide and zinc. The chrome wastes are treated using sulfur dioxide chrome reduction followed by chrome precipitation. First, the hexavalent chromium from the plating operation is reduced to trivalent chromium using sulfer dioxide in an acidic environment. Then, lime is used to raise the pH to approximately 8.5 allowing the chrome to precipitate as chromium (III) hydroxide. The zinc also precipitates as a hydroxide during this step. A polymer is used to increase the precipitate settling rate.

The cyanide wastes are treated using a two-step alkaline chlorination process. Gaseous chlorine is used to oxidize the cyanide to cyanate. Then, the cyanate waste stream is mixed with the reduced chromium waste stream at which point lime is added to the combined wastewater stream. The alkaline pH causes the cyanide to decompose into carbon dioxide and nitrogen. The combined waste stream then enters a sedimentation basin where the precipitate settles out. The supernatent from the settling basin is filtered through a diatomaceous earth filter and then discharged to a drainage ditch located north of the plant. This drainage creek discharges into Mill Creek which in turn discharges into the Mississippi River. The settled sludge is dewatered using a filter press and placed in a dumpster for disposal at the Browning Ferris landfill near Rockford, Illinois. This sludge is produced at a rate of between 12 and 20 cubic yards per week and has a moisture content of 40 percent.

Between 1971 and 1980, the sludge was placed in six sludge disposal pits located on the facility property (Figure 1). During this nine year period, approximately 1000 cubic yards of sludge were placed in these pits. Since the latter part of September, Collis has been removing the sludge from these pits and hauling it to the Rockford Browning Ferris landfill.

Jedder's hauling company of Clinton, Iowa has been transporting the waste from Clinton to Rockford. This dredging operation appeared to be approximately 50 percent complete at the time of this inspection.

According to Mr. Showerman, these pits are approximately seven feet deep, and the tops of the pit embankments are roughly 3 to 4 feet above ground level. The surface aquifer is reportedly about 4 to 5 feet below the ground level; therefore, the bottoms of the pits are approximately 0 to 2 feet above the shallowest water table. This shallow groundwater elevation corresponds roughly with the surface elevation of the drainage ditch located north of the pits. Collis is located in an old riverbed, and the underlying soil is primarily sand and silt. Thus, it seems unlikely that the underlying soil would offer substantial protection against leachate migration from the sludge pits. Furthermore, a dark liquid was observed in the bottom of sludge pits number 1 and 2 (see Figure 1). According to Mr. Arterburn, this substance was a water soluble oil leached from metal shavings that were dumped approximately 50 yards south of the pits several years ago. This oil was used for cooling any metal parts fabricated on lathes. Mr. Arterburn stated that tests had been run on this oil which determined that it was not toxic. The company neglected to save these analytical results; and therefore, this information is unavailable. The migration of this oil proves, however, that the soil structure probably would not inhibit leachate migration. These shavings are currently placed in a dumpster and taken to landfill for disposal.

Past Regulatory Actions

An extensive background search of past regulatory actions against Collis was not performed, however, a number of recent investigative actions were reviewed. The most recent inspection activity conducted by IDEQ took place on November 12, 1980, the day before the FIT inspection. IDEQ received a report of a fish kill downstream from the Collis wastewater effluent discharge point.

Steve Hoambrecker of Region 6 IDEQ performed this inspection. During his inspection, Steve observed Collis pumping the supernatant from one of the sludge pits to the railroad tracks located north of the company property. During this pumping operation, sludge from the pit was accidently sucked up by the pump and discharged to the railroad tracks. The approximate location of this spillage is indicated on Figure 1. The total volume of this spillage appeared to be approximately a third of a cubic yard. Mr. Showerman stated that he intended to have someone remove the spillage as soon as possible. Mr. Showerman also stated that the supernatent on this pond was only rainwater and that analytical tests had been performed on this water before pumping it out of the pits. Unfortunately, they again neglected to save the records of these test results.

On September 2, 1980, Bill Keffer observed sludge accumlations in the drainage creek approximately 100 feet downstream of the effluent discharge point from Collis. Steve Hoambrecker of IDEQ also observed sludge accumulations in this creek during an inspection on February 26, 1980. Effluent samples, runoff samples, and a sample of the sludge accumulation in the creek were collected. The results of these samples showed that Collis was violating its NPDES permit with respect to chromium. Also, the runoff from the facility property contained substantial chromium and other metal concentrations (12 to 140 ppm, chromium). Finally, the sludge in the creek was found to contain high levels of chrome (5500 ppm), zinc (2900 ppm) and cyanide (1800 ppm). Mr. Showerman stated that the drainage creek had been dredged approximately 1 year ago, so this sludge accumulation would be of a recent origin. A copy of Steve Hoambrecker's inspection report is attached to this report.

Sampling

A water sample was collected from the treatment plant effluent, and sludge samples were collected from the sludge dumpster and one disposal pit (number 3). The water sample (AN21C4) was collected from a copper tube in the filter house identified by Mr. Arterburn as being Collis's effluent sampling point. Three liters were collected for analysis of hexavalent chromium, pH, metals and cyanide. A one quart sludge sample (AN21C2) was collected from the sludge dumpster for analysis for hexavalent chromium, metals, and cyanide. A one quart sample (AN21C3) was also collected from sludge pit number 3 for analysis of hexavalent chromium, metals, and cyanide.

Cyanide sludge can decompose forming ammonia and cyanide gases. This decomposition is enhanced by acidic pH conditions; however, it can occur slowly at pH values greater than 7. The sample from the sludge pit was collected to indicate if cyanide degredation has occured, while the sludge sample from the dumpster was collected to determine the applicability of RCRA regulations to current treatment plant sludge. A comparison between the two sludge sample analytical results should provide an indication if cyanide sludge decomposition has occurred, however, more than two samples would have to be collected for any such comparison to be statistically significant. Also, Collis will not be able to remove all of this sludge by November 19, 1980 when the RCRA regulations become effective. The sample results from the sludge pit sample will also be useful for determining the applicability of RCRA regulations to this waste. Furthermore, the concentration of cyanide in the sludges could be used to determine the potential threat to health offered by the sludge should it decompose and release cyanide gas.

Based upon the ammonia smell noticed by the workers when dredging the first sludge pit, it seems likely that cyanide sludge decomposition has occurred in this pit. It is not clear why the odor was noticed in only one of the pits; however, the oil leachate in this pit may have had some effect on this sludge. When Mr. Showerman was questioned whether an ammonia smell had ever been observed during the excavation of the pits. He replied that he was not aware of any such odor. Mr. Arterburn, however, confirmed that an ammonia smell was noticed during the excavation of pit number 1. He also stated that he had consulted a chemist and was informed that the sludge could decompose releasing ammonia. Mr. Arterburn was not questioned as to whether or not he had informed Mr. Showerman of this possible sludge decomposition.

Future Treatment System Operation

Once the sludge pits are dredged, Collis is planning to convert the pits to sedimentation lagoons or basins. Instead of using lime to precipitate the metals and cyanide, sodium hydroxide will be used. This alteration should substantially reduce the volume of sludge produced by Collis. The precipitate formed using sodium hydroxide is smaller and more difficult to settle than that produced using lime. The lagoons will be used to increase the total system detention time to enhance settling. The effluent from the lagoon system will then pass through the existing sedimentation basin and through the filter prior to discharge. At this time, Mr. Showerman stated that they had no plans to install any type of liner beneath these lagoons, so leachate migration could be a substantial problem, especially since primarily water and not sludge will be placed in these lagoons.

Summary and Conclusions

On November 13, 1980 the Field Investigation Team of Ecology and Environment conducted an inspection of and collected samples from Collis Corporation in Clinton, Iowa. An effluent sample and two sludge samples were collected for analysis of hexavalent chrome, metals, and cyanide. Past regulatory involvement with Collis indicates that this company has violated its discharge standards and has been generally lax on environmental matters. The drainage creek adjacent to Collis has been significantly contaminated by runoff, sludge overflows, and effluent discharges from Collis. The creek adjacent to Collis at one time reportedly contained fish, however, the creek appears now to be devoid of fish. The treatment system, if properly operated, could eleiminate most of these problems. Leachate from beneath the sludge pits, however, could also contaminate this creek.

Based upon the past investigative findings, Collis merits close attention. Samples of the creek sediment should be taken to determine if the creek needs to be dredged again. The effluent from the treatment plant should also be carefully monitored and compared with Collis's records to determine the validity of Collis's analytical results. The sludge pits should be lined to prevent any leachate from entering the drainage creek. Once these pits are converted to sedimentation lagoons, the leachate problem could be expected to increase. Shallow wells will also have to be placed around the lagoon/pits to detect leachate migration. Finally, a containment system for runoff or spills at Collis should be constructed to prevent surface runoff from contaminating the drainage creek.

Attachments

Preliminary Assessment Form
Site Inspection Form
Surface Impoundment Inspection Form
IDEQ Inspection Report
Field Sheets
Chain of Custody Record